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AN INVESTIGATION INTO THE FREQUENCY OF NEEDLE STICKS INJURIES AMONG MEDICAL PROFESSIONALS AND AN EXAMINATION OF THEIR UNDERLYING CAUSES IN A HYDERABAD TEACHING HOSPITAL

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ABSTRACT

Background: Needle stick injuries (NSI) are known occupational risk for health care workers.NSI carry the highest risk of transmission of various blood borne infections. The most common causes of NSI differ from hospital to hospital .Prevention of NSI in a hospital can be planned by doing a root cause analysis.

Materials and methods: A cross sectional study was conducted amongst Healthcare workers (HCW) from January to December 2022 in a teaching hospital. All the HCWs who encountered NSI were interviewed to know the details of place of injury in the hospital, cause of injury, viral markers of source and HCW and vaccination status of HCWs. Exposed HCWs were followed up for 6 months for any seroconversion.

Results: The incidence of NSI in our study was 0.18. Majority of the NSIs occurred in the ER, ICU's and wards. The most common cause of NSI was improper sample collection followed by improper disposal of sharps. 35.3 % of the source patients were HBV positive and 23.52% were HIV positive. None of HCW was positive for HBV, HIV & HCV on baseline screening. 35.3% of them were protected against HBV infection. Follow up of health workers done 1,3,6 months after NSI revealed that 90.6% healthcare workers were tested negative for HBV, HIV and HCV.

Conclusion: Repeated training of HCW in hospitals regarding adherence to safety precautions for prevention of NSI's, proper technique of sample collection , proper disposal of biomedical waste and prevention of recapping of needles should be undertaken based on the common causes of NSI in the hospital concerned. Mandatory hepatitis B vaccination awareness programme in our hospital could be the reason for high HBV vaccination coverage among our HCWs.

KEYWORDS: Needle stick injuries, Healthcare workers, Root cause analysis.

INTRODUCTION

Percutaneous injury with needle stick or other sharps and splash injuries are the major occupational hazards among healthcare workers (HCWs). Hepatitis B virus (HBV), Hepatitis C virus (HCV) and HIV (human immunodeficiency virus) are the three major and most common blood-borne viruses that are transmitted through NSI. Highest risk of transmission is for HBV (3-10%) followed by HCV (3%) and HIV (0.3%). [1] Risk factors like reuse of syringes to administer injections to more than one patient, recapping needles, overuse of injections, unsafe sharps waste management, delay in performing first aid and improper use of appropriate PEP, increases the risk of occupational exposure. NSIs may also cause psychological effects on the patients and thereby increase the delay in taking immediate proper treatment which are associated with heavy cost to the patients. According to WHO, the average number of NSIs per HCWs varies from 0.2 to 4.7 injuries per annum? But majority of NSIs remain under-reported estimating the ranges from 26% to 85%. This may be due to lack of awareness, professional inexperience, unavailability of active surveillance, lack of training and time resulting from increased work pressure, lack of adequate protective medical/technical equipment. [2]. Study of NSI and its root cause analysis helps in formulating measures for prevention of NSI in hospitals. The aim of the study was to know the incidence of NSI among HCWs and its root cause analysis.

Methods

A cross sectional study was conducted amongst HCWs from January to December 2022 in a teaching hospital. All the HCWs who encountered NSI during this period were included in the study. The HCWs who encountered NSI were interviewed to know the details of place of injury in the hospital, cause of injury, HIV, HBV & HCV status of source patients, baseline screening test results of health care workers, immediate post exposure prophylaxis (PEP) taken in case of exposure with source who is known seropositive for HIV, HBV and vaccination status of HCWs. The HCWs were then followed up for 6 months to see for any seroconversion. All the data collected were compiled into a computer-based spreadsheet for analysis. All categorical variables were represented as percentages. Statistical analysis was done using the SPSS software version 20.

Results and Discussion

The incidence of NSI in our study was 0.18 which correlated with the study of Jayaprada et al [3] which revealed an annual incidence of NSI as 0.13. The incidence of NSI in India is 2.5 to 4.5 % per year. This suggests that the incidence of NSI in our study is much less than the incidence in India as a whole.

Area of injury	Present study	Apurba et al study [4]	Varun et al study [2]	Alfulayw et al study [5]
Intensive Care Unit	4[23.5%]	16.2%	48.1%	7.7%
Emergency Department	4[23.5%]	9.1%	48.1%	25.4%
Operation Theater	3[17.6%]	17.7%	3.3%	9.9%
Wards	4[23.5%]	28.3%	29.8%	32%
Outpatient Departments	0[0%]	9.1%	—	7.7%
Others	2[5.6%]	3.1%	1.4%	17.1%

Table 1: Table summarizes occurrence of NSI in various areas of the hospital.

Majority of the NSIs occurred in the ER, ICU's and wards (23.5%) followed by OT (17.6%), others (56%) as shown in table 1. Studies by Alfulayw et al [5] also found that sharp device injuries occurred most frequently in the wards followed by emergency rooms (25.4%) which correlated with our study .The low staff to bed ratio in wards and ER and workload in ER must meet the standards so that density of tasks will not endanger the well-being of the staff. Stressful working conditions, lack of adequate protective medical/technical equipment and poor work routines were suggested as other factors contributing to NSI. Empowering the staff in managing time and avoiding work overload can deal with this problem to a large extent. Adequate preventive care protocols for HCWs by training staff should be established in wards which is the main area where NSI are most common.

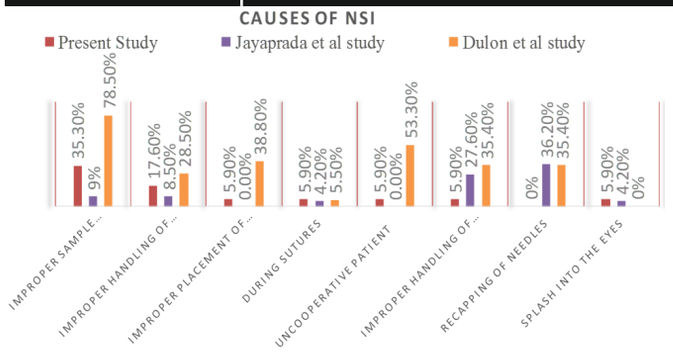

Figure 1: The graph demonstrates the various causes of NSI in the hospitals.

The most common cause of NSI in our study was improper sample collection (35.3 %) followed by improper disposal of sharps (17.6%). In the study of Jayaprada et al [3], recapping of needles (36.2%) was the most common activity leading to NSIs in HCWs followed by improper handling of BMW (27.6%). In Dulon et al study [6], the frequent causes of NSI were improper sample collection (78.5%) followed by venous cannulation and administration of injections. The common causes of NSI vary from place to place. Repeated training of HCW regarding taking safety precautions to be taken to prevent NSI's, proper technique of sample collection and administering injections, proper disposal of biomedical waste and preventing recapping of needles should be undertaken depending on the common causes of NSI in the hospital concerned.

When the HIV, HBV & HCV status of source patients was studied, it was observed that 35.3 % of the source patients were HBV positive and 23.52% were HIV positive. In Jayaprada et al [3] study, it was revealed that 50% & 42% were positive for HBV & HIV respectively. Apurba et al study [4] shows that only 4% were positive for HBV and 8% for HCV. HBV remains the most dangerous blood borne infection caused by NSIs.

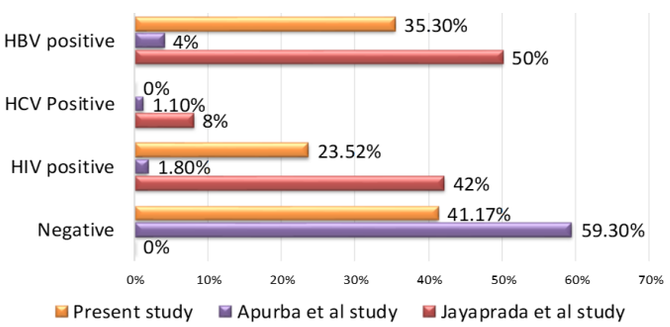

Figure 2: Graph demonstrates HIV, HBV, HCV status of source patients

Baseline screening test	Present study	Rakesh et al study [7]
Negative	100%	100%
Positive	0%	0%

Table 2: Table summarizes the baseline screening test results of health care workers who encountered NSI.

Baseline screening test results of health care workers who sustained NSI revealed that none of them were positive for HBV, HIV & HCV. Similar results were found in Rakesh et al study [7].

Anti HBsAg titers	Present study	Vishal et al study[8]	Varun et al study [2]	Rakesh et al study [7]
<10 IU	5.9%	30%	26.3%	16.7%
>10 IU	0%	10.8%	73.7%	6.4%
> 100 IU	11.8%	59.2%	----	------
> 1000 IU	23.5%	----	----	-----
Not done	58.8%	----	----	76.9%

Table 3: Table summarizes the Anti HBsAg titers of health care workers who encountered NSI.

Anti HBsAg titers of HCWs who sustained NSI revealed that 35.3% of them were protected against HBV infection. In Vishal et al study [8], 10.8% were protected showing >10 IU HBsAg titers when compared to Varun et al study [2] revealing 73.7% were protected. In Rakesh et al study [7], only 6.4% of them were protected.

HBV vaccination after NSI	Present Study	Varun et al study [2]	Jayaprada et al study[3]
Completely Vaccinated	5.9%	97.5%	55.3%
Vaccinated (before NSI)	94.1%	3.9%	19.1%

Table 4: Table summarizes HBV vaccination status of health care workers who encountered NSI.

HBV Vaccination status of HCWs who encountered NSI revealed that only 1[5.9%] of them got vaccinated after the NSI. In Varun et al study [2], it was shown that 97.5% got vaccinated after the incident of NSI and 3.9% were already vaccinated before the incident. This was compared to Jayaprada et al study [3] which revealed that 55.3% got vaccinated after the incident and 19.1% were already vaccinated. Mandatory hepatitis B vaccination awareness programme in our hospital could be responsible for high HBV vaccination coverage among our HCWs.

Follow up of HCWs	Present study	Mohsen et al study[9]
Negative test on follow up	90.6%	44.6%
Lost tofollow up	9.4%	55.4%

Table 5: Table summarizes the follow up of health care workers who encountered NSI.

Follow up of health workers was done in 1,3,6 months which revealed that 9 (90.6%) healthcare workers were tested negative for HBV, HIV and HCV. 8 (9.4%) HCWs were lost on follow up. In Mohsen et al study [10], it was shown that 44.6% were negative and 55.4% were lost on follow up. This suggests proper administration of PEP and a robust HBV immunization programme in our hospital. Proper counseling regarding importance of PEP continuation, maintaining confidentiality of intake of ART, managing adverse effects of ART is some of the important measures to be taken to improve follow up.

Conclusion

Adequate preventive care protocols need to be established in the medical and surgical wards where most of the NSIs are taking place. Specific information should be provided to all healthcare providers regarding the care that should be taken during provision of injections and recapping of needles, since they constitute the highest proportion of NSIs in the hospital. Repeated training of HCW regarding taking safety precautions to be taken to prevent NSI's, proper technique of sample collection and administering injections ,proper disposal of biomedical waste and preventing recapping of needles should be undertaken depending on the common causes of NSI in the hospital concerned. Mandatory hepatitis B vaccination awareness programme in our hospital could be responsible for high HBV vaccination coverage among our HCWs.

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Author Contributions: GP and MVR conceptualize the study, PB collected data and GP and MKV interpreted the results, GP and MVR wrote the manuscript and MKV edited and revised the draft.

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Data Availability: Not applicable

Declarations

Ethical approval: The study was carried out as per the instruction and guidelines of Institute Ethical Committee i.e. Apollo Institute of Medical Sciences and Research Hyderabad, India.
Competing interest: The authors declare that they have no conflict of interest.

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